Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Chirality-Dependent Vapor-Phase Epitaxial Growth and Termination of Single-Wall Carbon Nanotubes BILU LIU, JIA LIU, CHONGWU ZHOU, University of Southern California, USC NANOLAB TEAM — Chirality-pure single-wall carbon nanotubes are highly desired for both fundamental study and many of their technological applications. Recently, we have shown that chirality-pure short nanotubes can be used as seeds for vapor-phase epitaxial cloning growth, opening up a new route toward chirality-controlled carbon nanotube synthesis. Nevertheless, the yield of vapor-phase epitaxial growth is rather limited at the present stage, due to the lack of mechanistic understanding of the process. Here we report chirality-dependent growth kinetics and termination mechanism for the vapor-phase epitaxial growth of seven single- chirality nanotubes of (9, 1), (6, 5), (8, 3), (7, 6), (10, 2), (6, 6), and (7, 7), covering near zigzag, medium chiral angle, and near armchair semiconductors, as well as armchair metallic nanotubes. Our results reveal that the growth rates of nanotubes increase with their chiral angles while the active lifetimes of the growth hold opposite trend. Consequently, the chirality distribution of a nanotube ensemble is jointly determined by both growth rates and lifetimes. These results correlate nanotube structures and properties with their growth behaviors and deepen our understanding of chirality-controlled growth of nanotubes.

Liang Chen
None

Date submitted: 15 Nov 2013 Electronic form version 1.4